NOTES FROM PACIFIC COAST OBSERVATORIES.

The Relation Between the Separation and the Number of Visual Double Stars.[1]

In the course of my double-star survey I have been impressed with the fact that the number of close pairs discovered far exceeds the number of pairs separated by moderate distances. More than 70 per cent of the 3,500 pairs so far discovered in this work have measured distances of 2″ or less, and about 50 per cent distances of 1″ or less.

We should, of course, expect to find an excess of apparently close double stars, on the assumption that the binary systems are distributed in space with approximate uniformity; the systematic character of the survey and the fact that a larger percentage of the easier pairs has been discovered by earlier observers are also large factors in producing the observed excess. But the question arises, whether the closer double stars are not actually as well as apparently more numerous.

To investigate this question counts were made of all the double stars in Part I of Burnham's "General Catalogue of Double Stars within 121° of the North Pole," and also of all the double stars found on the Lick Observatory charts of the sky north of + 36° declination, omitting a very few charts that have not yet been compared with the sky. In the former count only stars having one component as bright as 9.5 magnitude were included; in the latter only those in which the double-star system (i. e., both components combined) was as bright as 9.0 B. D. magnitude. In both counts only pairs as close as or closer than 5″.0 were included.

The stars were tabulated according to distance by half-seconds of arc in both counts, and, according to brightness, by whole magnitudes in the count from the catalogue and by half-magnitudes in the count from the charts, the stars brighter

[1] Abstract of *Lick Observatory Bulletin*, No. 176.

than 6.0 being included in a single group in each case. After tabulating the results, the effect of parallax was taken into account, and by the use of appropriate factors, derived from KAPTEYN'S researches on the average parallaxes of the stars, the numbers of each distance class were formed on the assumption that all of the double stars were removed from us to the distance,—in the first case of the average star of 8.5 magnitude, in the second case of 8.75 magnitude.

The first count included 6,973 pairs, or, neglecting those in which both components are as faint as 9.1 magnitude, 5,809 pairs. The second count includes 2,169 pairs in a sky area containing 44,634 stars of 9.0 B. D. magnitude or brighter.

The figures in each of the two tables (here omitted) show very clearly—(1) that the actual number of close double stars greatly exceeds the number with moderate distances between the components, and (2) that the increase in number progresses with the decrease in separation.

By comparing the total numbers of double stars of the various orders of magnitude in the second count with the total numbers of B. D. stars of corresponding magnitudes in the sky area examined, it also appears that one star in thirteen or fourteen of those as bright as 8.0 B. D. magnitude is a double star under 5″.0, while among the stars between 8.0 and 9.0 magnitude the ratio is only 1 to 25. This would seem to indicate either that the number of visual double stars under 5″.0 is greater among the brighter stars or that a larger percentage of the latter has been discovered. The latter alternative would strengthen our first conclusion, stated above. The fact that the observations of CAMPBELL, FROST, and others have shown that one star out of five or six of those with well-determined radial velocities is a spectroscopic binary, and that the average magnitude of the known spectroscopic binaries, excluding the variable stars, is about 4.0, makes the ratios just given at least of interest if not of significance.

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NEW DOUBLE STARS.

In the course of my regular double-star work I have recently found closer companions to the three double stars Σ 772, Σ 1064, and Ho 357. In the first star each component proves to be a